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MEMORANDUM OF UNDERSTANDING
BETWEEN
THE NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
OF THE UNITED STATES OF AMERICA
AND
THE CENTRAL AMERICAN COMMISSION
ON THE ENVIRONMENT AND DEVELOPMENT
FOR COOPERATION IN SUPPORT OF THE DEVELOPMENT OF A
MESOAMERICAN BIOLOGICAL CORRIDOR

The National Aeronautics and Space Administration of the United States of America (hereinafter referred to as "NASA") and The Central American Commission on the Environment and Development (whose membership consists of the Governments of Belize, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, and Panama and hereinafter referred to as "CCAD"), together hereinafter referred to as "the Parties" to this Memorandum of Understanding,

RECOGNIZING the utility of satellite observations of the Earth for understanding environmental change in Central America;

NOTING that the Mesoamerican Biological Corridor, running through the Central American isthmus, was established in 1997 by the Presidents of the seven countries with membership in CCAD as a crucial environmental region with a central development concept -- integrating conservation and sustainable use of biodiversity within the framework of sustainable economic development, and SHARING an interest in promoting the development of the Corridor;

RECALLING their ongoing cooperative effort to improve CCAD's holdings of environmental information within the CCAD environmental data and information system;

RECOGNIZING the utility of creating a "benchmark" map, derived from satellite data, that classifies land cover and land use throughout the Central American isthmus;

NOTING the importance of researchers throughout Central America being trained in the analysis of remote-sensing information;

APPRECIATING the need to improve scientific understanding of the amount of carbon sequestered by the biomass of the Central American isthmus; and

DESIRING to establish mutually-beneficial scientific cooperation between CCAD and NASA;

HAVE AGREED AS FOLLOWS:

ARTICLE 1 -- PURPOSE

The purpose of this Memorandum of Understanding (MOU) is to define the terms and conditions for cooperation between the Parties in the following areas:

- Development of maps classifying the land cover of the Central American isthmus according to, inter alia: (1) life zones; (2) land-use types; (3) geological structure; and (4) hydrology. These products will be used in the development of a Mesoamerican Biological Corridor;

- Joint activities dedicated to increasing the quality of information held in and usefulness of CCAD's environmental data and information system, such as providing CCAD with optical, radar, and topographic remote-sensing information and climate and ocean information from NASA archives and on-going remote-sensing projects for use in developing and maintaining the Mesoamerican Biological Corridor and for a large number of other applications within the Central American isthmus, including: regional development, urban planning, assessing the vulnerability of areas in the region to natural hazards, promoting meteorological and marine research;
- Improving the understanding, through model-based estimates, of the amount of carbon sequestered in the ecosystems of the Central America isthmus;
- Building the capacity among Central American researchers to analyze and use remote-sensing information and to develop an environmental data and information system through training and exchange of personnel with NASA; and
- Facilitating connections between Central American researchers and other U.S. Government institutions involved in Space and Earth science research and applications.

ARTICLE 2 -- NASA RESPONSIBILITIES

For its part, NASA shall use reasonable efforts to carry out the following responsibilities:

1. Process Japanese Earth Resources Satellite 1 (JERS-1) imagery, held by the Alaska Synthetic Aperture Radar (SAR) Facility, of the entire Central American isthmus;
2. Use JERS-1 SAR imagery to generate a mosaic of the entire Central American isthmus;
3. Combine the mosaic data with topographic information of the Central American isthmus obtained from Jet Propulsion Laboratory (JPL) archives, releasable data obtained during the Shuttle Radar Topographic Mission (SRTM) and from a NASA commercial purchase of airborne SAR data covering approximately 40,000 square kilometers of Central America and provide these combined data and topographic information to CCAD for inclusion in the CCAD environmental data and information system;

4. Establish, in consultation with CCAD, the selection criteria for intensive site study areas and select several intensive site study areas imaged in the mosaic for subsequent co-registration and analysis with Landsat (and possibly other) data, consult with CCAD regarding their acquisition of additional satellite imagery (Landsat data, etc.) for the intensive site study areas, and seek to obtain "U.S. Government and Affiliated User Status" for CCAD, to assist CCAD in its purchase of Landsat data;
5. Support, as appropriate and mutually agreed, CCAD as it conducts the analysis of the intensive site study areas;
6. Classify the mosaic according to land-cover/land-use characteristics, including life zones;
7. Analyze the data to estimate forest age classes, structure, and biomass; and derive model-based estimates of the terrestrial carbon content of the Central American isthmus;
8. Establish, in conjunction with CCAD, a plan for a ground-based campaign(s) (which is separate from that identified under Paragraph (4) above) to validate the land-cover/land-use classification for the Central American isthmus;
9. Work with CCAD to define the CCAD environmental data and information system in order to incorporate information from this project into a system capable of supporting users throughout Central America;
10. Provide, as appropriate and mutually agreed, researchers and students to work with CCAD to facilitate data analysis required to accomplish this project;
11. Provide, as requested by CCAD and mutually agreed by NASA, information and methodologies for assessing the vulnerability of the Central American isthmus to climate variability and other natural hazards;
12. Facilitate, as requested by CCAD, connections between Central American researchers and other U.S. Government institutions involved in Space and Earth science research and applications; and
13. With CCAD, mutually establish a five-year time table and requirements schedule showing critical phases of the program and required milestones.

ARTICLE 3 -- CCAD RESPONSIBILITIES

For its part, CCAD shall use reasonable efforts to carry out the following responsibilities:

1. Coordinate the selection of a technical team of Central American experts, and define the operational ground rules and organizational structure for this team to interact with its NASA counterpart;
2. Send personnel to the NASA Marshall Space Flight Center's Global Hydrology and Climate Center and JPL to participate with researchers there in the processing and analysis of remote-sensing information in order to ensure its successful infusion into the development and management of the Mesoamerican Biological Corridor, and encourage scientists from the CCAD member countries to develop research activities using NASA data provided to the CCAD environmental data and information system;
3. Establish, in consultation with NASA, the selection criteria for intensive site study areas; select, along with NASA, several intensive site study areas imaged in the mosaic for subsequent co-registration and analysis with Landsat (and possibly other) data; acquire additional satellite imagery (Landsat, etc.) for the intensive site study areas; and, with support from NASA and as appropriate and mutually agreed, conduct analysis of data from these intensive site study areas;
4. Establish, in conjunction with NASA, a plan for the conduct of a ground-based campaign(s) (which is separate from that identified under Paragraph 3 above) to validate the land-cover/land-use classification of the Central American isthmus; and independently conduct the ground-based validation campaign(s), which will include field data collection to support the research objectives;
5. Develop, maintain and operate an integrated Internet Web site, as part of the CCAD environmental data and information system, providing access to data and information products from this project and from other regional activities of interest to the NASA Earth science research community;
6. Establish a high-speed electronic connectivity capability among the key Central American database centers where the information will be deposited;
7. Conduct, at its discretion, periodic repeats of the land-cover/land-use classification of the Central American isthmus to update the mosaic and the CCAD environmental data and information system and make the results of these efforts available to NASA;
8. Identify the needs and key sectors for assessing the vulnerability of the Central American isthmus to climate variability and other natural hazards and for pursuing adaptation options, and conduct any resulting assessment; and

9. With NASA, mutually establish a five-year time table and schedule showing critical program phases, requirements and milestones.

ARTICLE 4 -- POINTS OF CONTACT

The CCAD and NASA points of contact for this MOU, who are responsible for coordinating and implementing the agreed-upon functions and responsibilities of each Party, will be indicated in an exchange of letters between the Parties.

ARTICLE 5 -- DATA DISTRIBUTION

All remote-sensing and validation data and information obtained as a result of this cooperative activity and all standard products produced will be made available (after an initial calibration period for the new products produced) to all potential users without restriction, and at no more than the cost of fulfilling the user request.

ARTICLE 6 -- FUNDING

The Parties shall each bear the costs of discharging their respective responsibilities under this MOU, including travel and subsistence of each Party's personnel and transportation of its own equipment and associated documentation. The obligations of the Parties under this MOU are subject to their respective funding procedures and the availability of appropriated funds.

ARTICLE 7 -- CUSTOMS AND TAXES

Each Party shall arrange duty-free customs clearance and a waiver of applicable customs duties and taxes for equipment and related goods necessary for the implementation of this MOU, in accordance with respective national laws and regulations. In the event that any customs fees and/or taxes of any kind are still levied on the equipment and related goods necessary for implementation of this MOU, after seeking to develop the free customs clearance and waiver of applicable customs duties and taxes, such customs fees or taxes shall be borne by CCAD for fees and/or taxes levied by one of its member states and by NASA for fees and/or taxes levied by the United States. Such arrangements shall be fully reciprocal.

ARTICLE 8 -- PERSONNEL ACCOMMODATION

1. Each Party may send appropriate personnel and/or personnel of its contractors and subcontractors and affiliated research institutions into facilities of the other Party, when necessary to implement the dispatching Party's responsibility under this MOU, with the approval of the receiving Party.
2. The personnel of the dispatching Party or the personnel of its contractors and subcontractors and affiliated research institutions shall comply with the internal rules of the receiving Party's facilities.
3. The Parties shall accommodate each other's personnel or the personnel of the other Party's contractors and subcontractors and affiliated research institutions, as mutually agreed.
4. Subject to national laws and regulations, CCAD will facilitate provision of the appropriate entry and residence documentation for U.S. nationals who enter, exit, and reside within the territory of CCAD member states and NASA will facilitate provision of the appropriate entry and residence documentation for nationals of CCAD member states who enter, exit, and reside within the territory of the United States, in order to carry out activities under this MOU.

ARTICLE 9 -- NECESSARY EQUIPMENT

1. The Parties, subject to their national laws and regulations, may bring appropriate equipment into facilities of the other Party, with the approval of the other Party, when such equipment is necessary to implement responsibilities under this MOU.
2. The Parties may use equipment provided by the other Party with the approval of that Party when such equipment must be used to implement responsibilities under this MOU.
3. Each Party shall retain ownership of equipment it furnishes to the other Party.

ARTICLE 10 -- EXCHANGE OF TECHNICAL DATA AND GOODS

The Parties are obligated to transfer only those technical data and goods necessary to fulfill their respective responsibilities under this MOU, in accordance with the following provisions:

1. All transfers of proprietary technical data and export-controlled technical data and goods are subject to the following provisions. In the event a Party finds it necessary to transfer goods which are subject to export control or technical data which is proprietary or subject to export control, and for which protection is to be maintained, such goods shall be specifically identified and such technical data shall be marked with a notice to indicate that they shall be used and disclosed by the receiving Party and its related entities (e.g., contractors and subcontractors) only for the purposes of fulfilling the receiving Party's responsibilities under the programs implemented by this MOU, and that the identified goods and marked technical data shall not be disclosed or retransferred to any other end use or entity without the prior written permission of the furnishing Party. The receiving Party agrees to abide by the terms of the notice, and to protect any such identified goods and marked technical data from unauthorized use and disclosure, and also agrees to obtain these same obligations from its related entities prior to the transfer. Nothing in this article requires the Parties to transfer goods or technical data contrary to national laws and regulations relating to export control or control of classified data.

2. All goods, marked proprietary data, and marked or unmarked technical data subject to export control, which are transferred under this MOU, shall be used by the receiving Party exclusively for the purposes of the programs implemented by this MOU.

ARTICLE 11 -- INVENTION AND PATENT RIGHTS

1. Except as set forth in paragraph 2 of this Article, nothing in this MOU shall be construed as granting or implying any rights to, or interest in, patents owned or inventions which are independently developed by the Parties or their contractors or subcontractors.

2. In the event that an invention is jointly made by any combination of the Parties during the implementation of this MOU, patent protection shall be requested jointly by the Parties involved on the basis of equal rights, unless otherwise agreed by the Parties involved, taking into consideration their respective contributions to the invention.

ARTICLE 12 -- PUBLIC INFORMATION AND RIGHTS IN SCIENTIFIC PUBLICATIONS

1. The Parties retain the right to release public information regarding their own activities under this MOU. The Parties shall coordinate with each other in advance concerning public information activities which relate to the other Party's responsibilities or performance under this MOU.

2. In the event the Parties or their investigators publish results primarily obtained from information regarding results obtained from the implementation of this MOU, the Party involved with the publication shall make this information available to the other Party, and each Party shall, at minimum, have a royalty free right to reproduce, use, and distribute the publication for its own purposes.

3. In no event shall a Party include in a publication technical data or information on technical goods furnished by the other Party which is to be protected in accordance with Article 10 of this MOU, or information disclosing the other Party's inventions before patent application, without the other Party's prior written consent.

ARTICLE 13 -- LIABILITY

1. Neither Party shall make any claim against the other, its employees, a related entity of the other (e.g., contractors, subcontractors, investigators, other participating entities), or employees of the other's related entities for injury to or death of its own employees or employees of its related entities, or for damage of any kind to or loss of its own property or that of its related entities arising out of activities under this MOU whether such injury, death, damage or loss arises through negligence or otherwise, except in the case of willful misconduct. In addition, each party shall extend the cross-waiver of liability as set forth above to its own related entities by requiring them, by contract or otherwise, to agree to waive all claims against the entities or persons identified above.

2. In the event of a third-party claim for which the Parties may be liable, the Parties shall consult promptly to determine an appropriate and equitable apportionment of any potential liability and on the defense of any such claim.

ARTICLE 14 -- ADDITIONAL AGREEMENTS

The Parties may enter into additional agreements, as necessary and mutually agreed, for future cooperative activities.

ARTICLE 15 -- AMENDMENT AND EXTENSION

This MOU may be amended and extended by written agreement of the Parties.

ARTICLE 16 -- ENTRY INTO FORCE, DURATION AND TERMINATION

1. This MOU shall enter into force upon the date of the latter signature of the Parties and shall remain in force for a period of five (5) years.
2. This MOU may be terminated upon ninety (90) days written notice by either Party. Neither Party shall have the right to any claim whatsoever for compensation or damage as a consequence of termination of this MOU. Termination by either Party will not affect that Party's continuing rights and obligations under this agreement with regard to liability and the protection of technical data, goods, and intellectual property rights, unless otherwise agreed.

**FOR THE NATIONAL AERONAUTICS
AND SPACE ADMINISTRATION
OF THE UNITED STATES
OF AMERICA:**



Done at: Washington, DC
Date: December 10, 1998

**FOR CENTRAL AMERICAN
COMMISSION ON THE
ENVIRONMENT AND
DEVELOPMENT:**



Done at: Washington, DC
Date: December 10, 1998

I certify this to be a true copy of the original.

Shari Kamm